What is claimed is:

1. A unit element for a heat sink, comprising:

a series of inlet tubes having a range of diameters, the range of diameters including a maximum inlet tube diameter and a minimum inlet tube diameter:

a series of outlet tubes having a range of diameters, the range of outlet tube diameters including a maximum outlet tube diameter and a minimum outlet tube diameter;

at least one inlet tube having the minimum inlet tube diameter being in flow communication with at least one outlet tube having the minimum outlet tube diameter.

2. The unit element for a heat sink according to claim 1, wherein the inlet tubes and the outlet tubes are constructed using a plurality of layers of material, each layer having openings adapted to define the desired geometry of each tube.

3. The unit element for a heat sink according to claim 2, wherein the layers include layers made from a structural material and a sacrificial material.

4. The unit element for a heat sink according to claim 3, wherein the sacrificial material is etched to form the opening.

5. The unit element for a heat sink according to claim 3, wherein the sacrificial material is fired to form the openings.

6. The unit element for a heat sink according to claim 3, wherein the structural material comprises silver.

7. The unit element for a heat sink according to claim 3, wherein the structural material comprises nickel.

8. The unit element for a heat sink according to claim 3, wherein the sacrificial material comprises copper.

9. The unit element for a heat sink according to claim 3, wherein the sacrificial material comprises a polyimide material.

10. A heat sink comprising:

a plurality of tubes in fluid communication with one another, each of the tubes having a radius that is essentially governed by the following relationship:

$$r_0^3 = r_1^3 + r_2^3 + r_3^3 + \ldots + r_n^3$$

where r_0 is the radius of an incoming tube, and $r_1, r_2, \ldots, r_n$ are the radii of outgoing tubes.

11. The heat sink according to claim 10, wherein the plurality of tubes are constructed using a plurality of layers of material, each layer having openings adapted to define the desired geometry of each tube.

12. The heat sink according the claim 11, wherein the layers include layers made from a structural material and a sacrificial material.

13. The heat sink according to claim 12, wherein the sacrificial material is etched to form the openings.

14. The heat sink according to claim 12, wherein the sacrificial material is fired to form the openings.

15. A method of constructing a heat sink comprising:

selectively depositing a structural material on a substrate;

depositing a sacrificial material on the substrate; and

planarizing the structural material and the sacrificial material.

16. The method of claim 15, further comprising:

building successive layers using the method of claim 15.

17. The method of claim 16, further comprising:

etching the sacrificial material.

18. The method of claim 15, wherein the sacrificial material comprises copper.

19. The method of claim 15, wherein the structural material comprises nickel.

20. A heat sink apparatus comprising:

a plurality of heat sink elements, each of the heat sink elements having a three-dimensional network of heat transfer passages therein;

a manifold having a supply port and a discharge port adapted to be connected to at least some of the plurality of heat sink elements; and

a fluid that contains phase change nanoparticle materials.

21. The heat sink apparatus of claim 20, wherein the phase change nanoparticle materials include encapsulated phase change nanoparticle materials.

22. The heat sink apparatus of claim 20, wherein the phase change nanoparticle materials include non-encapsulated phase change nanoparticle materials.

23. The heat sink apparatus of claim 20, wherein the phase change nanoparticle materials include emulsion phase change nanoparticle materials.

24. The heat sink of claim 20, wherein the phase change material comprises a liquid encapsulated in a polymer.